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GUIDE TO Fruit Growing



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INTRODUCTION

In this book will be found valuable instructions on orchard work, the life and habits of the principal insect and fungi diseases that infest orchards of all kinds, and how to control them. We have tried to make this a practical guide, and, at the same time, as brief as the subject treated would permit.

We call your special attention to the subjects, "How to care for young trees after the farmer receives them," "How to set them out," Cultivation and pruning, etc., and to the Spray "Calendar."

It is necessary to spray each kind of fruit according to the calendar. 90 per cent. of young trees die after the farmer receives them from neglect. If he would use the same care and judgment in handling and transplanting his trees as he does other plants the loss would be reduced to almost nothing. We hope every farmer who purchases nursery stock from us will follow the instructions laid down in this little book.

CAUSES OF FAILURES

In order to explain the causes of failures, we will state briefly what must be done to an orchard in order to get annual crops, and what effect failure to do this work has upon the bearing of the tree. There are three things absolutely necessary to be done to an orchard in order to get annual crops:

First—The orchard must be annually cultivated, either by clean cultivation or the mulch system.

Second—The trees must be annually pruned.

Third—The trees must be annually sprayed.

It is necessary to cultivate an orchard for the same reason that it is necessary to cultivate any other crop—to conserve the moisture in the ground. If the weeds and grass are allowed to take the corn crop or the orchard, the effect is the same—the weeds and grass, having so many more fibre roots than the tree or corn, take all the moisture out of the ground. Then the question will be asked, “What effect has this moisture upon the tree or the corn?” There are three principal elements of plant food upon which all vegetable life depends, namely, Nitrogen, Phosphoric Acid, and Potash.

Phosphoric Acid and Potash are mineral elements distributed in minute particles throughout the soil. These minerals are soluble or dissolve readily in water, so that in the event weeds and grass be allowed to take the corn or the trees they are robbed of the moisture which should be construed to hold these two elements of plant food in solution, so the roots of the tree or corn can take them up.

Then again the question may be asked, “What effect will robbing the tree of these two elements of plant food have upon the growing or bearing of the tree?” Nitrogen gives to all vegetable life its foliage and growth, while Potash builds up the wood fibre, and may be compared to the bones of the body, affording strength, while Phosphoric Acid matures the wood and fruit buds and ripens and matures the fruit. As an illustration, take a field of wheat that is growing well enough and the grain ripens but won't stand up, we know that the soil is deficient in Potash; but if it grows all right and stands up, but won't ripen properly, we know that the soil is deficient in Phosphoric Acid; but if the wheat is scrubby and stands up, and what little grain it has ripens, we know that the soil is mostly deficient in Nitrogen. This knowledge should be worth something to the farmer in growing any kind of crop—that it is necessary to cultivate in order to preserve moisture in the soil.

It is necessary to prune annually in order to keep up the vitality of the tree. An apple tree must do three things in a season to

give annual crops of fruit; it must be able to make a terminal growth of at least twelve inches all over the tree, and at the same time mature its present crop of fruit and form fruit buds for the next season's crop. If the tree is overtaxed with superfluous limbs and water sprouts it can not accomplish these three things in one season, and unless pruned judiciously the tree will become an every-other-year or every-third-year bearer, or at least the crops will be scanty and of very inferior quality.

It is necessary to spray in order to combat the insect and fungus diseases that affect the leaves, the tender branches, the bloom and the fruit. No orchardist will undertake to grow fruit without annual spraying.

The apple scab is causing more failures than frosts, freezes and everything else. The scab is a fungus disease that works on the leaves, the tender twigs, the bloom and the apple. On the leaves it causes those dark olive spots, and the leaf curls up and falls off prematurely. The function of the leaf is the same to all vegetable life as that of the lungs is to the body, for all material for growth taken in through the roots must circulate through the cambium layer to the leaf, there to be carbonized before that food can be assimilated or appropriated for tree growth; so the tree can only appropriate its food according to the condition of the foliage. It must be remembered that nine-tenths of all the Nitrogen utilized by the tree comes from the atmosphere through the leaf, and unless the foliage is kept in a healthy condition the tree can not make its wood growth, nor can it properly mature the fruit or the fruit buds, and the tree would have no resisting power to withstand frost and freezes, and as a result the crops of fruit would be killed in the bloom or in the bud. The scab may so injure the tender twigs as to prevent a tree from forming fruit buds, or they may so injure the bloom as to cause it to fall off, or cause the young apple to fall off, for all of which the farmer is ready to blame Providence.

It is necessary to spray to destroy the apple scab, the codling moth, the leaf aphid, the brown rot of stone fruits, and many other fungus and insect diseases that infest the orchards and are causing so many failures.

It must be borne in mind that to do any two of these things and neglect any one will make the orchard a failure. We would suggest and heartily recommend that every farmer write to the Secretary of Agriculture, Washington, D. C., and to the Commissioner of Agriculture of his own state, and to the Superintendent of the Experiment Station of his own state, and ask each of these departments to put his name on their permanent mailing list for farm bulletins; and especially do we recommend that they get Bulletin

No. 155, issued by the Virginia Agricultural Experiment Station at Blacksburg, Va., Bulletin No. 161, United States Department of Agriculture, Washington, D. C., and Bulletin No. 70 of the West Virginia Agricultural Experiment Station, Morgantown, W. Va. Any of these bulletins will be furnished free on application.

Apple orchards, if properly cared for and of the right varieties, will give an annual revenue of from \$100.00 to \$750.00 per acre, and peaches will return about the same. Cherries and plums will return a revenue of from \$100.00 to \$200 per acre, grapes \$500.00 per acre, and pears the same as apples.

LOCATING AN ORCHARD

Fruit of any kind or variety can be grown successfully anywhere it has ever been grown before, if given proper care and insect and fungus diseases are combated. This may be taken as an infallible guide for all who contemplate setting an orchard. The most experienced fruit growers differ as to the best exposure, some claiming a northern or northeastern to be the best, while others claim the eastern to be the best, and still others claim a southern or western exposure to be the best. It is the opinion of the writer, after much careful investigation, that more depends upon the cultivation and spraying for insect and fungus diseases than upon the exposure.

I have seen successful orchards with all these exposures, and we have an orchard of fifty-two acres of our own covering all these exposures. And there are successful orchards on most any kind of soil you can think of. Orchard lands should always be well drained, and, if located on a hillside, should be higher than the immediate surrounding, so as to have free circulation of air.

How to Care For Young Trees After the Farmer Receives Them.

As soon as the trees are received by the farmer the roots should be well wrapped in blankets so as to protect the roots from the cold air and the bad effects from drying out in transit home with the trees. On arrival home they should be immediately heeled out, that is, a ditch cut long enough so as the strings can be cut from around the trees and the trees spread out in the ditch so no two will stand touching each other. The ditch should be about twelve inches wide and eighteen inches deep, but before setting the trees in the ditch make up a thick paste of mud and water and dip the

roots into this paste, then pack the earth securely around the trees after they have been placed in the ditch so as to exclude the air. It is the air that goes to the roots that causes injury to the roots, also the top, and where two trees are touching each other the dirt can not be packed securely between the trees so as to exclude the air. The trees should be allowed to remain in the ditch until they are to be set in permanent orchard, and for setting out trees in permanent orchard see instructions.

How to Set Trees For Clean Cultivation.

The land should be thoroughly broken with a turning plow nine to eleven inches deep. A sub-soiler should be run after the turning plow. The lands should then be well harrowed.

Next, with a long bulltongue plow, lay the orchard off in rows the desired width.

Next, take a drill or crowbar, drive it down 5 to 6 feet deep in the furrow at the proper distance, then use from 1-4 to 1-3 stick of dynamite to each hole. This will loosen the subsoil so as to conserve moisture and destroy all insects. Then set your tree so it will stand about two inches deeper than originally in the Nursery rows and large enough to receive the trees with all the roots in their natural position, so as not to double or cross any of the roots. We recommend the pruning of the roots before setting; by so doing it will cause the roots to start an abundance of feeding rootlets. Before setting the trees in the holes already prepared make up a stiff pud of water and clay and dip the roots into it, then place the tree in the bottom of the hole and throw in a shovel of the top earth, shake the tree a little up and down, then lean it considerably to the South-west. Then fill the hole up to within an inch of the top and tramp the earth well as you fill in, then add the top inch and let it remain loose.

Next, you will want to fill up the ditch to keep the water from standing or gathering about the tree, which may be done by running a shovel plow aside the rows or with a harrow.

How to Set Trees in Sod or Land Too Steep to be Cultivated, and Where the Mulch System is to be Practiced.

First, take a drill or crowbar and drive it down 5 or 6 feet, then use about a 1-3 of a stick of dynamite to each hole to loosen up the subsoil and destroy insects. Then place your tree in the hole with all the roots spread out in their natural position, so as not to double or cross any of them, allowing the tree to be set about two inches deeper than it was originally in the nursery row; then make a good stiff pud of clay and dip the roots of the trees in it; set the tree in the bottom of the hole, spreading the roots. Then commence put-

ting some good rich soil on the roots and tramping it tight until the hole is entirely filled. Then cover the top with loose dirt not packed. If land is tight dynamite each hole, using 1-5 to 1-4 of a stick.



Fig. 1.—The above illustration represents a cultivated and uncultivated fruit tree in a dry season.—U. S. Department of Agriculture.

If trees are set in the fall, hill up around them to prevent water from standing, and work down in the spring. If set in dry weather, use an abundance of water in the hole, but not on top. If it becomes



Fig. 2.—Effects of different systems of culture on the growth of apple trees: *a*, clean cultivation; *b*, cropped with oats; *c*, cropped with clover; *d*, cropped with bluegrass.—U. S. Dep't Agri.

necessary to water the trees in dry weather, the ground should be loosened soon thereafter to prevent it from baking. We recommend pruning the roots before setting, as this will cause them to start an abundance of fibrous roots.

METHODS OF CULTIVATING AN ORCHARD

(By "orchard" we mean any kind of fruit)

There are two methods known to successful orchardists, the results of which are about the same—clean cultivation and the mulch system. The object of the clean cultivation, especially when the trees are young, is to prevent the grass and weeds from growing in the orchard, which robs the tree of plant food and moisture, and if the tree doesn't die its growth is retarded. The object of the mulch system is to accomplish the same purpose, and as a means of keeping land from washing where orchards are located on hillsides.

Clean Cultivation Method



Fig. 3

Fig. 3.—This cut represents a young apple tree, called by nurserymen "whins," and shows by the line where to prune it. This is by far the most satisfactory apple tree the farmer can buy, as the head is formed low down and the tree has a perfect root system, and the chances are that, ninety-nine times in a hundred, it will live when transplanted, where a tree with branches will not. As authority we refer you to Farmers' Bulletin No. 113, issued by the U. S. Department of Agriculture. In the four cuts following this is shown—first, in cut No. 4, the whip after one year's growth, with dotted lines showing where to prune it; cut No. 5 shows, after two years' growth, with dotted lines where to prune it; cut No. 6 shows the same tree after three years' growth; cut No. 7 shows the same tree after the fourth year. It is impossible to show by dotted lines, after the third year, where to prune it, but we feel sure the instructions given you on pruning will enable you to do the work correctly.

An orchard should be plowed four or five times, commencing in the early spring, the last plowing being about the first to fifteenth of July, and these plowings must be kept up from year to year. The best thing to use in an orchard is a regular extension disc harrow, made especially for orchards, (they are so constructed as to extend out from the horses like the blade of a mowing machine), or a light-plowing two to four-plow cultivator. The plowing should not be too deep, so as to tear up the roots, and should be done often enough to keep all the weeds and grass killed out. If the orchardist hasn't a disc harrow and can not afford to buy one, then he can plow only close enough to the

trees to keep from injuring them, then use the hoe to clean out the grass and weeds and keep the ground smooth about the trunk. If desired, the orchard may be cultivated in any crop that can be plowed and hoed the first four years, provided the land is sufficiently fertile.

Never sow wheat, oats or any other crop in an orchard that cannot be cultivated with a plow unless you mulch around the trees eight or ten feet, depending upon the age of the tree.

The Mulch System of Cultivation

As early as possible after the trees are set they should be mulched, anyway before they begin to make their spring growth. Rotten straw, hay or any kind of vegetable matter may be used for mulching. The first year put the mulch about six inches deep around the tree, leaving a space of six inches next the body of the tree uncovered, and let it extend four to six feet out from the tree. Throw a few rocks or a little earth on the mulch to keep it from blowing away. After the first year the orchard can be mulched at haying time, with the grass cut off the orchard, if desired. Clover is the very best grass to grow in an orchard.

The mulch must always be kept thick enough all over the ground under the trees to prevent weeds and grass from growing and to keep the whole of the ground thoroughly moist, otherwise it is far better to cultivate. This process of mulching must be continued year after year; and, where it can be had, good stable manure or wheat straw should be used to mulch the trees as soon as they are set out, or very early the next spring. Don't expect your trees to live and grow unless you care for them. Where it is desired to change an orchard from the clean cultivation to the mulch system, it may be done by sowing the orchard in grass and mulching. We recommend the mulch system for steep land, and land liable to wash, and for the improvement of the land if properly done.

Pruning the Orchard

APPLE TREES.—If what is known as a "whip," or tree without

branches, is planted in orchards, it should be pruned or cut back to within 20 to 24 inches of the ground as soon as set out; or, if set in the fall, cut back the next spring when the buds first begin to swell, when the ground is not frozen. If trees with branches are to be set in the orchard they should be pruned by cutting off all the branches except three, which should be left (as in case with the bud and the whip, explained further on), but each

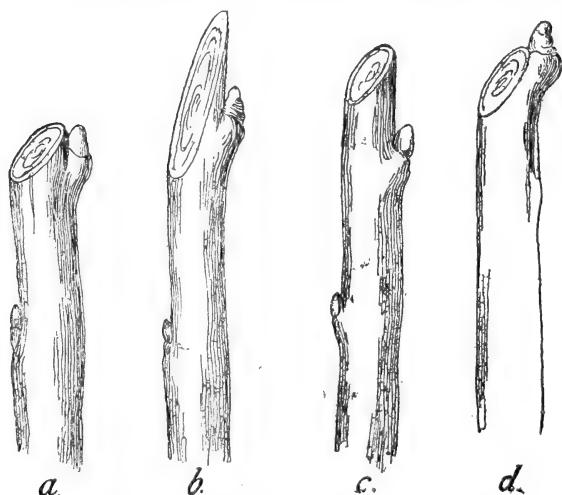


Fig. 8.—Showing right and wrong way to prune top or branch of a young tree—*a*, the right way; *b*, *c* and *d*, the wrong way.

in case with the bud and the whip, explained further on), but each

branch should be cut back to within eight inches of the main body and the central shaft cut out. This first pruning or cutting back is done in order to form the future head of the tree low down and to give an open top to admit sunlight, free circulation of air and prevent

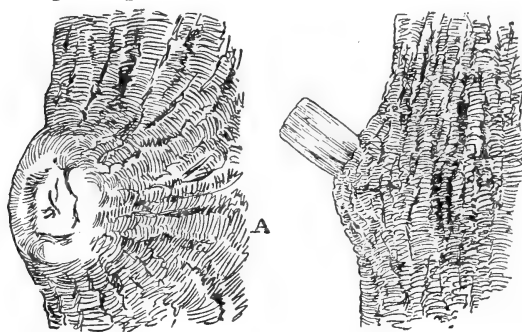


Fig. 9.—Result of correct and incorrect pruning: *a*, correct method, after two years; *b*, incorrect method.—U. S. Department of Agriculture.

damage from wind, to shade the ground and keep the temperature low about the base of the tree, so as to prevent the rapid evaporation of moisture and prevent sun scald, and to be easily sprayed and convenient for picking the fruit. This cutting back or first pruning of the whips will cause several of the upper buds to break and grow the following

spring. And these should be noted, and only such left to grow as are to form the main branches—say three or four at equal distances apart around the stem, two or three inches above each other, and such as incline to an outward growth. Leave the first bud, if possible, lowest down on west side; the rest of the buds should be either rubbed or pinched off. The branches to be left should be selected so as not to form a natural fork, no two branches being directly opposite. During early spring, before the buds begin to swell, or even late in winter for convenience—any time when the wood is not frozen—each year the trees should be carefully pruned, all water sprouts removed, and

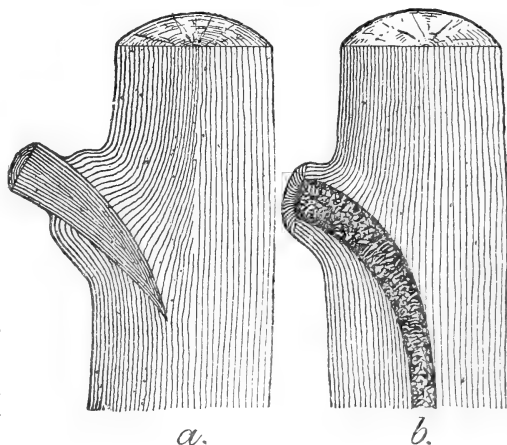
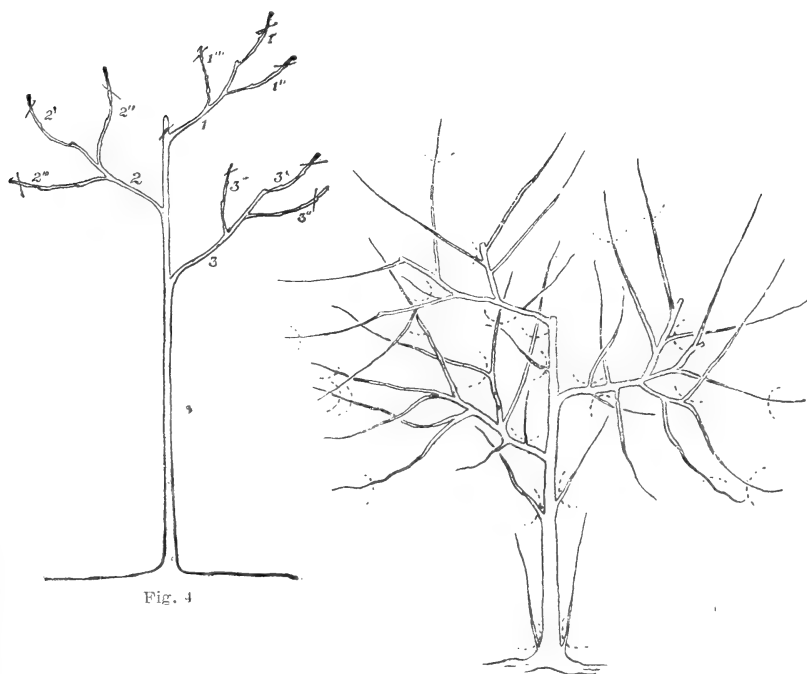


Fig. 10.—Process of decay due to improper pruning: *a*, dead stub; *b*, decay of heart.—U. S. Dep't of Agriculture.

all branches that are likely to interfere with or cross another branch should be cut out. Any branch that starts straight up should be removed and the centers of dense growth thinned out. Side branches that are making a stronger growth than others should be checked by heading in the terminal or center shoots, and all parts of the tree should be cut where needed to make an evenly balanced head.

Fertilization of Orchards

Where the terminal branches of the trees do not make a growth of at least twelve inches (by measurement) for the previous year, it is a sign that the trees need fertilizer. Barnyard manure is the very best fertilizer, or peas or clover may be sowed with the last plowing of the trees and allowed to remain on the ground all the winter, their turned under early the next spring. This not only adds an abundance of plant food to the soil, but humus. Where orchards are mulched they will not need fertilizers.



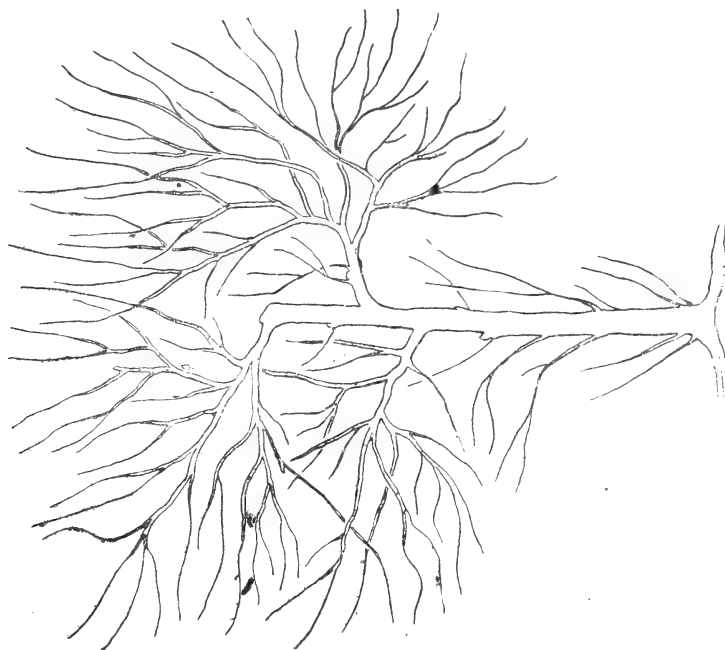


Fig. 7

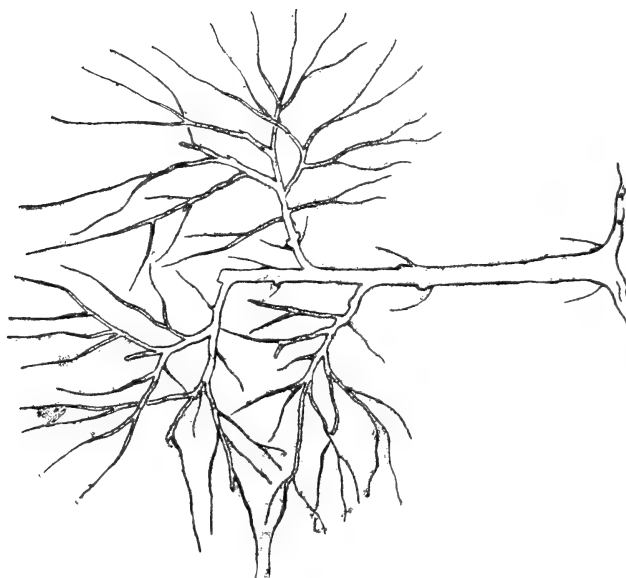


Fig. 6

PROTECTING THE BODY

From Year Book 1909 Department of Agriculture of Virginia.

As the removal of any considerable part of the top often exposes the body of the tree to the direct rays of the sun, it is well to whitewash the trunk and main branches. The whitewash reflects the rays

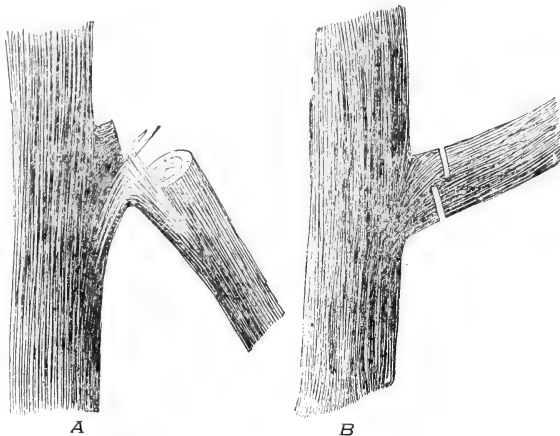


Fig. 11.—*a* represents a method of cutting off a large limb that should be avoided; *b* shows how to cut off a large limb.—U. S. Department of Agriculture.

of the sun, and by such an application many cases of sun scald may be avoided. A good whitewash



Fig. 12.—Represents a young peach tree just from the nursery, showing how it should be cut back.

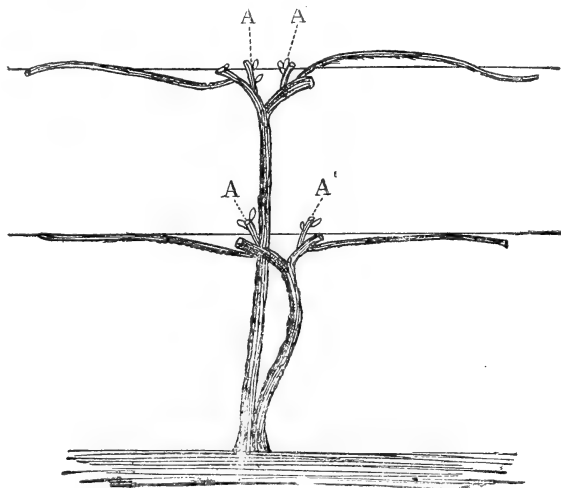


Fig. 13.—This and the two following cuts (Figs. 14 and 15) show three successful ways of pruning and trimming grapevines.—U. S. Department of Agriculture.

may be prepared by using one pound of good quicklime to each gallon of water. The addition of salt to each three gallons of the wash tends to make it stick better. This can be best applied with a spray

pump. A good coating can only be secured with two applications, the second to follow as soon as the first is dry.

Here we desire to quote, for the benefit of the farmer, from the United States Department of Agriculture, Bulletin No. 113 pg. 27:

"Some varieties have an upright habit of growth and some have slender growth. Such need close attention each year in cutting back one-half of last year's wood growth, leaving the top bud on the side of the branch facing the direction to which it is intended to divert the growth. By this treatment there will be no difficulty in shaping the tree into any desired form. Open spaces in the tree may be closed up—as, for instance, when the tree has been deprived of a necessary branch by accident or otherwise, the loss may be recovered in time by pruning the adjoining branches so as to divert the growth into the portion made barren of branches. All pruning and training possible should be

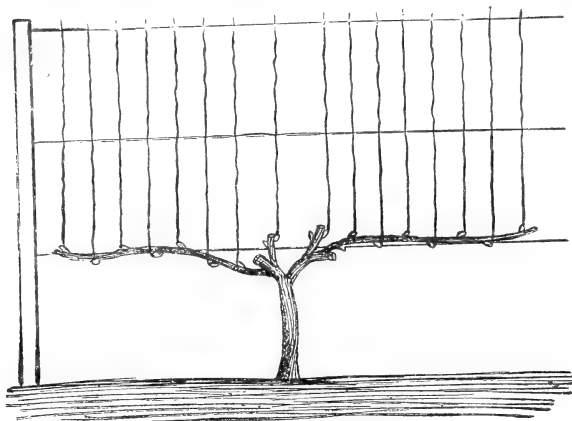


Fig. 14

done while the trees are young and the growth of wood tender, as the healing over is then more rapid and complete and the tree suffers less injury by the operation. If ever it becomes necessary to remove a large branch the wound should be covered with grafting wax, paint, or some other substance that will prevent evaporation and keep the wood from checking and consequent decay."

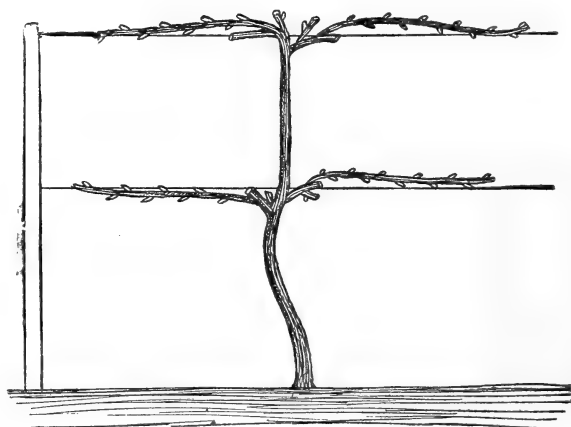


Fig. 15

Sometimes the apple, as well as the peach tree, has a too rapid growth, and instead of forming fruit buds it extends its branches,

and oftentimes the farmer is discouraged, believing he has a barren tree. It is only necessary to give such a tree a mid-summer pruning, which stops the growth of the tree and causes it to form fruit buds for the next year's crop; or a very light mid-summer pruning by cutting back each terminal branch to one-half its previous year's growth, given to a three-year-old, will increase the yield the fourth year, but this should never be done unless the trees have been properly cared for and have a good growth, otherwise over-bearing would injure the tree.

THE PEACH.—The first pruning should be done in the same way and at the same time as the apple, by cutting it back to within a foot or foot and a half of the ground, and remove all branches below the pruning point close up, for the same reason that the apple tree must be cut back, and it must be managed and pruned from year to year about the same as an apple. The first spring the three or four buds left to form the main head of the tree should be a few inches apart up and down the main stem, and at equal distances apart around the main stem, the same as an apple tree. Give the peach tree an annual pruning in the early spring, just before the buds burst open, by cutting back one-half the previous year's growth.

PEAR TREES.—The pear will require only heading in to prevent it from growing too tall and to make it spread. Beside this very little pruning will be required, except for pear blight. If the pear whip is used cut it back as you do the apple.

CHERRIES AND PLUMS.—These trees will require very little pruning unless it is to cut out dead limbs and cross limbs.

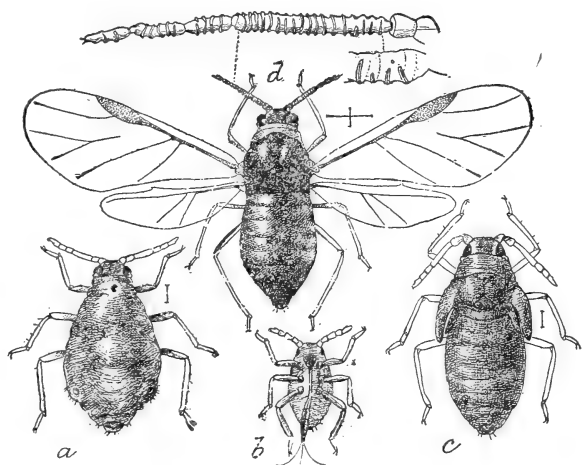


Fig. 16.—Woolly aphid: *a*, agamic female; *b*, larva louse; *c*, winged female; *d*, winged female with antenna enlarged above with the waxy excretion removed.—U. S. Department of Agriculture.

GRAPES.—Grapes must be pruned late in the winter or early in the spring of each year. There are many methods of pruning and we have selected what we deem the best, which is represented by pictures and will be more satisfactory in every way than if we tried to explain with words. These methods of pruning and training are in practical use in California and other sections of our country where

grape culture is the principal industry. (See Figs. 13, 14 and 15.) It is absolutely necessary to prune apple orchards, peach orchards and vineyards, in order to maintain the vitality of the trees and vines and to grow fruit of fine quality. Use your pruning knife freely.

Thinning Peaches

Every successful peach grower thins his fruit. "The principal object in thinning fruit," says Hon. G. W. Koener, Commissioner of Agriculture for the State of Virginia, "is to give size, flavor and color, which determine the success of the fruit grower." In thinning fruit, take hold of the limbs with the left hand and pull the fruit off with the right; and remember that a short, stocky limb will be able to support its fruit much closer than a long, slender branch. A good time to thin is two weeks after the blossoms fall until the fruit is large

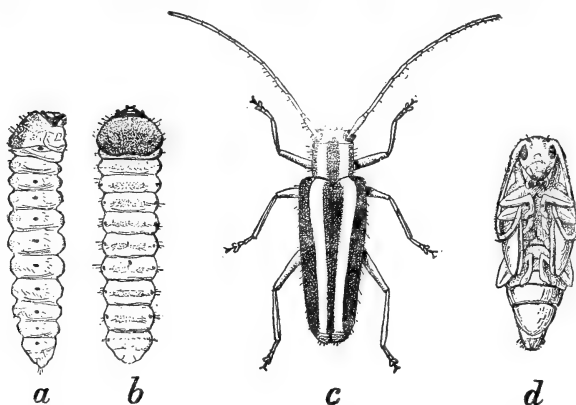


Fig. 17.—The round-headed apple tree borer; *a* and *b*, larvæ; *c*, beetle; *d*, pupa.—U. S. Department of Agriculture.

as a hazelnut. The proper distance to thin is about 7 inches apart third year and 4 inches apart fourth year. The farmer sometimes has an off-year-bearing tree. This is caused by the tree over-bearing, as it can not form fruit buds for the coming year and at the same time mature its fruit. Thinning regulates the tree and causes it to bear annually.

SMALL FRUITS.—The small fruits, such as raspberries, blackberries, gooseberries, currants, etc., ripening from the first of June until fall, are everywhere capable of successful cultivation. They yield large returns at comparatively small expense. Currants and gooseberries should be set in rows 6 feet apart and 3 to 4 feet apart in the row, raspberries and blackberries same distance as currants and gooseberries, and can be set between apple trees in the orchard.

PRUNING RASPBERRIES.—Pinch off the canes when 3 feet high and prune the laterals the following spring within 12 to 17 inches of the canes. Cut out the old wood each year just after the berries are harvested.

Insect and Fungi Diseases That Infest Orchards

Some of the insects and fungi diseases are controlled by spraying. On another page you will find the spray calendar, and, on another page, instructions for making the different mixtures for spraying purposes. It will be necessary to spray all fruits according to this calendar, and by doing so you will control most all the pests that can be controlled by spraying with insect and fungicides.

□ **Apple Tree.**—THE WOOLLY APHIS.—Adult insects are found in two forms and can be seen by carefully examining a colony late in the summer. One form have wings, while the other and more numerous form have no wings, but excretes from its pores a bluish-white downy or cotton matter that covers the insect and renders it very conspicuous, as it resembles a bit of cotton. It works on the roots of the tree and does very little damage anywhere else. It sucks the juices from the roots, causing an abnormal growth or gall-like swelling. These swellings are usually irregular and knotty and sometimes attain considerable size, the aphid being found in great numbers over these galls. The roots thus attacked soon begin to decay and die outright. The infested apple tree appears sickly, it does not grow as it should, its leaves are less numerous and have a yellowish or pale green color, and the fruit, if any, is of a very inferior quality. Oftimes the apple blossoms will drop off, or later the young fruit, and the farmer is apt to imagine the cold snap caused it. The tree soon dies or blows over.

Remedy.—Remove the earth around the tree for about two feet and apply fine tobacco dust or tobacco stems, and replace the dirt. This never fails to kill them. Hot soap-suds is also an excellent remedy.

LEAF APHIS.—These plant lice are found in the spring upon the apple leaf. They are about one-tenth of an inch long and of a yellowish-green color. The winter is passed in the egg, and one can very readily see these eggs on the twigs during the winter, where they appear as minute, oval, glossy black specks, usually deposited about the base of buds on the smaller twigs or in crevices of the bark. In the spring, about the time the leaves begin to bud, they hatch and begin at once to stick their beaks through the tissues of the unfolded leaves and extract the sap. This often happens, but the farmer attributes the shedding of leaves or the dropping of young fruit to atmospheric conditions.

ROUND AND FLAT-HEADED BORERS.—Every farmer is familiar with these insects, and no lengthy description of their life and habits is necessary. The borer beetles are nocturnal in their habits and deposit their eggs about the first of June. In about two weeks the eggs hatch into a minute worm which immediately bores through the bark and begins to feed on the sap wood. At the close of the first season the flat-headed borer goes into what is known as the pupa state, and from the pupa state it emerges a full grown beetle fly. If there is only one present in a tree it may not be noticed, but several would be apt to girdle a small tree and kill it. The round-headed borer, at the close of the first season, remains quietly between the bark and the wood the first winter, and the second year of its life it passes into the sap wood, but confines itself to no small area and may work around a small tree, completely girdling it. The second winter is also passed next the sap wood, but the third season finds him boring into the heart of the tree, and in case of a small tree the channel may extend nearly through it. After boring into the heart of the tree the channel through which it entered is closed with sawdust-like castings, and another opening is made through which the adult may escape the following spring.

Remedies.—Many remedies have been given. If Formula No. 1 be rubbed on the tree with a cloth for about two feet from the ground up, about the first of June, it is said it will prevent the beetles from depositing their eggs; but the surest way is to make a close examination about the 15th of July, again about the 15th of August, and again about the 15th of September, and with some sharp instrument dig them out, and you are safe for another twelve months.

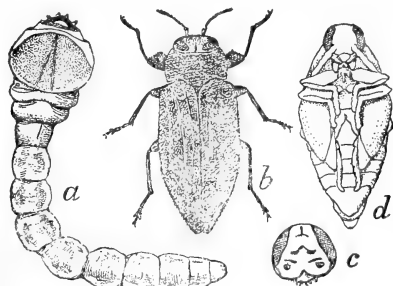


Fig. 18.—Flat-Headed Borer: *a*, larva; *b*, beetle; *c*, head; *d*, pupa.—U. S. Dep't of Agriculture.

SAN JOSE SCALE.—The San Jose scale is one of the most dangerous and injurious insects we have to contend with in apple orchards. It multiplies with great rapidity and even poisons fruit trees upon which it may be feeding. They are of an ashen-gray color, sometimes decidedly dark, and resemble the bark, and sometimes cover the tree so that the scales overlap one another. Such a tree has the appearance of being covered with wood

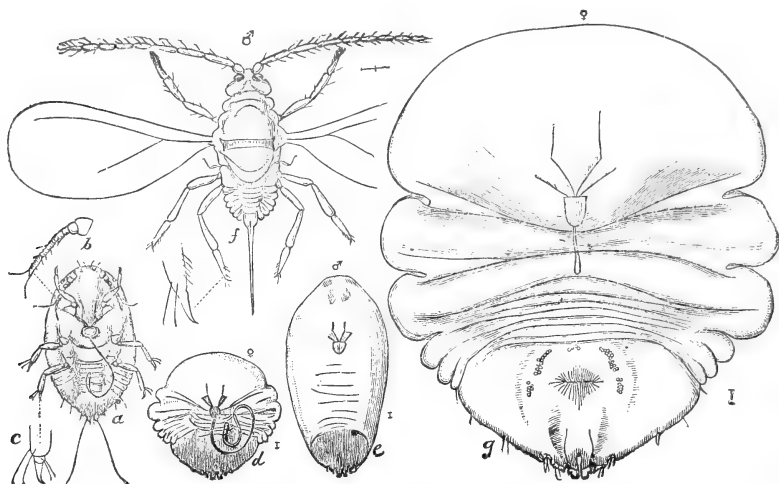


Fig. 19.—Different stages in the life of the San Jose scale, greatly magnified

ashes. By turning the scale over it will be found to have an orange or yellowish cast. They are very small, and, as they live upon the sap of the tree, they kill the tree in from one to three years.

Remedy.—The tree should be pruned back severely and sprayed with Formula No. 2, early in the spring, before the buds begin to swell, and the work should be done thoroughly, as it is necessary to touch each scale in order to kill it. If the spraying can not be done in the spring it may be done in the autumn, after the leaves fall.

OYSTER-SHELL SCALE, OR BARK LOUSE, is a very common insect to be found on apple or pear trees. It is not regarded as very injurious, but may become so if the tree is neglected. The insects are covered with dark brown or grayish colored scales, shaped something like an oyster shell, about one-sixth of an inch in length, and remain attached to the twigs and limbs and can not move. They may overlap each other and completely cover the bark if neglected, which might injure the tree. Controlled by spraying.

SCURFY SCALE.—The scurfy scale infests the apple and pear and is very common. It is of a light grayish-white color and somewhat triangular in shape. As these insects are almost white they attract a great deal of attention and are frequently mistaken for San Jose scale. They do no harm, and no attention should be paid to them.

CODDLING MOTH.—This insect, together with the apple scab fungus, is doing more injury, perhaps, to apples and some other fruit than anything else. So often have I heard complaint coming from farmers that the fruit was killed in the bud, or killed in the blossom, or killed when the little apple first appeared by a little cold snap, and that there is no use trying to grow fruit, that climatic conditions had changed; when the truth of the matter was that the whole cause of the trouble was the coddling moth and apple scab. The moth first appears in the spring, about the time the apple blooms, and con-

tinues to emerge for about three weeks. The adult is about five eighths of an inch across its expanded wings, and of a gray chocolate color. They deposit their eggs soon after the blossom falls, usually in the bloom of the young apple; later in the season they may deposit their eggs at various places on the apple. The egg is deposited at night, and rarely is there ever more than one egg deposited on an apple. The egg hatches in a few days and the larva eats its way through the skin into the pulp and down to the core, around which it feeds until a full grown larva.

When full grown the larva leaves the apple by eating a hole to the outside, then crawls down the tree until it finds a suitable place in which to spin the cocoon, in which it is transformed to the pupa stage. They do this under

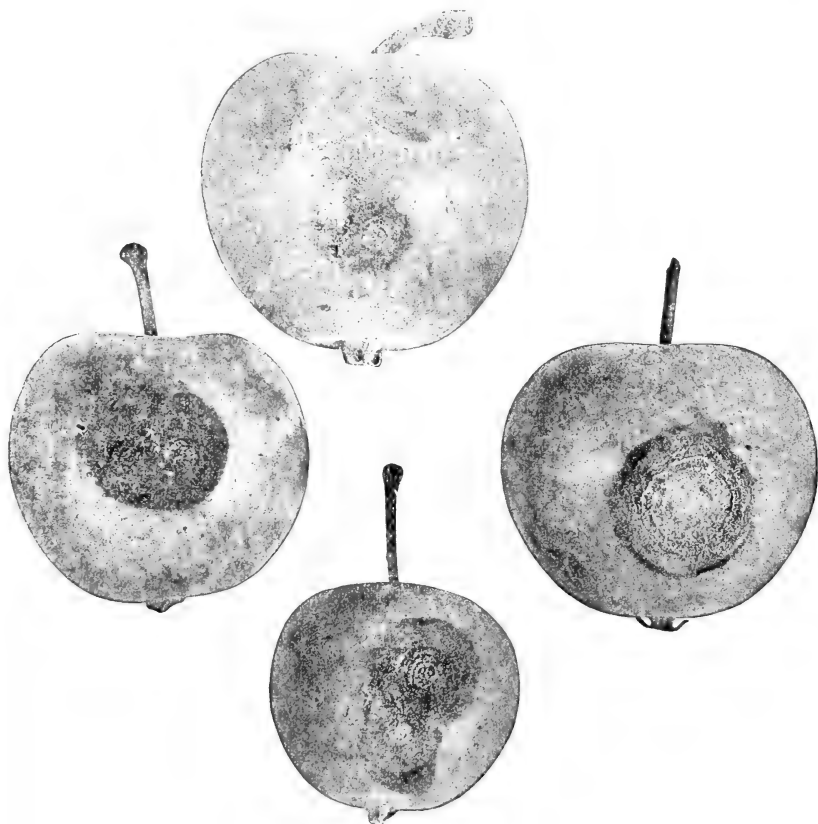


Fig. 20.—Various stages of the bitter rot fungi, greatly enlarged.—U. S. Dep't of Agriculture.

any kind of rubbish or loose bark on the tree, and in about six weeks from the time the egg is deposited a full grown moth emerges from the cocoon. The moth immediately lays the egg for the second brood most any place on the apple, and as this is sometimes late in the season, the larva does not always grow to maturity and get out before winter, hence the worm in the apple. Controlled by spraying.

APPLE SCAB.—It is found, from microscopic examination of this fungus, that it consists of an upright stalk or spores, and these spores float about in the air, thus spreading the disease. It attacks the leaves, blossoms and fruit, and is found on young twigs as well. Oftimes when the blossoms fall, or the young fruit fails to set, or the young apples drop, the fungus is responsible for it, while the farmer imagines it was the freeze. On the fruit the fungus forms a circular spot of dark, smoky green or nearly black color, usually marked at the edge by a pale line, where the skin of the apple is slightly raised. These spots begin to appear when the fruit is half grown, or earlier.



Fig. 21.—Limb with bitter rot cankers, from a living apple tree.

and old sore places on the tree and paint it with coal tar, or some other disinfectant, and gather all the mummified fruit that remains on the ground and burn it. It is then controlled by spraying.

Single spots may reach the size of a dime, and when close together they unite and cover considerable space. This retards the growth of apple tissues and the apple becomes more or less distorted and irregular, and radiating cracks may appear. On the leaves the fungi appear as dark green spots, mostly on the upper side of the leaves, which may be completely covered. This retards the growth of the leaf, which is more or less curled and falls off prematurely. If you will spray you will have fruit, and you will discard the theory that it is the frost and freezes that cause the failure. No spraying, no fruit.

BITTER ROT FUNGI.—This disease appears on other fruits, such as peaches, grapes, cherries and plums. In many instances the attack begins when the fruit is not half grown, but its greatest severity, in a majority of instances, is just before the fruit ripens, and continues after the fruit is picked if conditions are favorable. The first indication of the trouble is a small circular spot, usually on the smooth, unbroken surface of the fruit. The skin appears to be thin and slightly sunken, and when developing rapidly several spots appear on the same fruit, and if not arrested will involve the whole fruit in decay. Upon the body or the limbs of the tree will be found cracks resembling old sores. Bitter rot causes immense damage in orchards.

Remedy.—Shave off the canker

THE APPLE TREE TENT CATERPILLAR.—Every farmer is familiar with this insect and its habits, and it is not necessary for us to give a description of it.

Remedy.—In spraying for other diseases the caterpillar is kept killed

out; or, by taking a forked stick the web and the whole of the inhabitants may be wound up without the loss of a single one.

APPLE LEAF RUST.—It appears in the spring in the form of minute yellow specks. The leaves finally turn yellow and drop off, thus impairing the vitality of the trees. This disease has a peculiar habit, shared with a number of other diseases—that of living two cycles of existence. They commence their existence as spores on the cedar ball and float through the air from the cedar ball to the apple tree leaves, (some varieties of apple being more susceptible than others) and from the apple leaves back to the cedar balls for winter quarters. They are inconceivably small, but can be recognized with the naked eye on the under side of the leaf by raised, warty places.

Remedy.—Remove the cedar trees to a good, safe distance from the orchard. (To prevent rabbits from barking the trees, take a hog's liver and rub the tree about twice during winter.)

Other Diseases

There are some other insect and fungus diseases that infest apple orchards which are not yet fully classified or understood, that are destroyed or held in check by spraying for other diseases.

Insects Injurious to the Peach

BLACK PEACH APHIS.—Attacking the roots. These aphids are almost black in color and are found principally on the roots of peach trees, although they sometimes get on the leaves. Their life and habits are about the same as the woolly aphis that infests the roots of the apple tree. The insects do considerable injury to the peach where they occur in large numbers. The tree has a sickly appearance, which is frequently taken for the "peach yellows." Spray.

THE PEACH TREE BORER.—The adult moth differs from most moths in that its wings are more or less transparent and shaped like the wings of a wasp. A good idea of these moths can be had from the pictures in this volume.

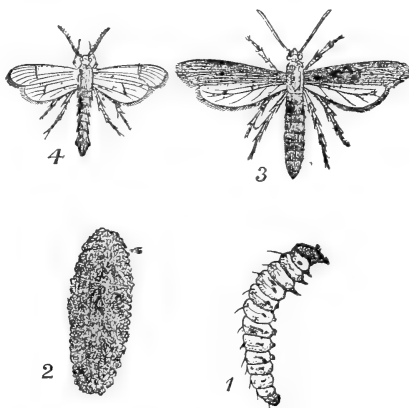


Fig. 22.—The peach tree borer—1, larva; 2 the pupa; 3 and 4, beetle.

The adult moth comes forth in the spring, usually in May, and continues to emerge until well in July. The eggs are deposited as a rule from about the 14th of May to the 1st of July, on the bark at or near the surface of the ground, but sometimes on the trunk, and even on the larger limbs. The young larvae or borers hatch out during the latter part of May to July, and are very active, rapidly eating their way through the bark to the sap wood, usually entering through a crack or crevice. They feed in the cambium layer, enlarging their tunnels as they grow. If the tree is small, or if there are several borers in the same tree, they may girdle and kill it, or at least greatly weaken it and when cold weather comes they pass the winter in their burrows. The next spring they become full grown,

after they are fed for a time, and may be located by a gummy sawdust exuding from the tree. The larva or borer is soon transformed to the pupa state and comes forth as an adult moth.

Remedies.—Use the same method as that used for the apple tree borer.

THE PIN HEADED PEACH BORER is of European origin, and has in recent

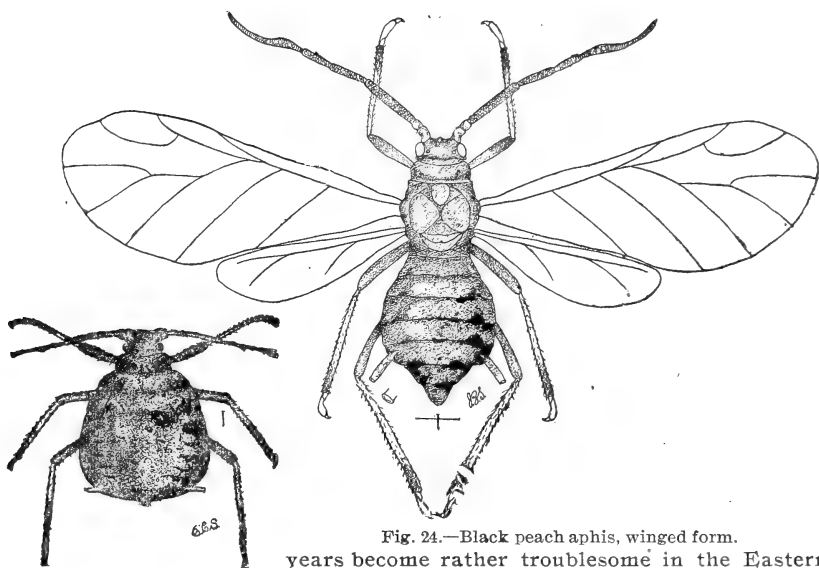


Fig. 23.—Black peach aphid, the common wingless form.—U. S. Dep't of Agriculture.

Fig. 24.—Black peach aphid, winged form. years become rather troublesome in the Eastern part of the United States.

Remedy—The best remedy is to annually remove all dead wood from the orchard and pile it and burn it. This should be done in the fall or winter. The insect prefers sickly trees and while the larva is generally confined to such trees, it often attacks healthy trees. When it attacks a tree, stimulate the growth with manure.

THE PEACH BARK LOUSE.—These scaled insects are about one-eighth of an inch in diameter, and of somewhat circular form. The color varies from a bright red to almost black, and are very conspicuous on smaller trees where the bark is smooth. The eggs will be found during the early spring massed together, and they hatch about the first of June into very small lice-like creatures that crawl about the trees, inserting their beaks here and there until they find a suitable place where they remain the rest of their existence, if they be females. The males finally develop wings and fly away. Sometimes they appear in great numbers and injure the vitality of the trees. Controlled by spraying.

PEACH TREE APHID THAT ATTACKS THE LEAVES.—It very much resembles the black peach aphid and its life and habits are much the same, except

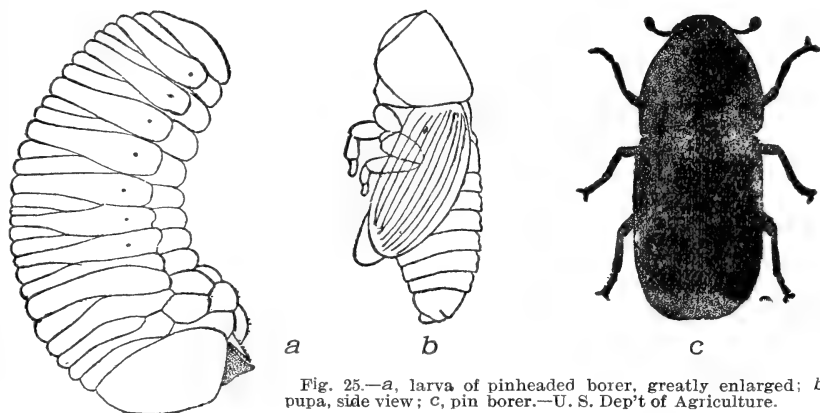


Fig. 25.—*a*, larva of pinheaded borer, greatly enlarged; *b* pupa, side view; *c*, pin borer.—U. S. Dep't of Agriculture.

its small glossy black eggs deposited on the limbs in the fall of the year, and as soon as the buds begin to swell the following spring they hatch and begin to suck the sap from the unfolding leaves. They multiply very rapidly and may completely cover the leaves, but as they are preyed upon by many other insects they are usually held in check. They cause little elevated places on the leaves and give the tree a very sickly appearance. Controlled by spraying.

THE CURCULIO.—This insect does great injury to apples and peaches, as well as plums. It is the insect which causes the sting in the apple. The adult beetle appears in the month of August, and begins at once to sting the apple, but begins earlier on peaches, by feeding upon them. They eat small holes through the skin and into the pulp. These holes cause the apple to decay at these places and render them unfit for storage purposes, while in the peach it sometimes heals up and not so much damage is done. Controlled by spraying.

BROWN ROT OR FRUIT MOLD.—This is the most serious disease of the plum, cherry and peach yet known. Usually the first symptom of this disease to attract attention is the numerous grayish-white pustules that appear on the attacked fruit when it is nearly ripe. The fungus consists of spores which, when examined under the microscope, are seen to be oval in shape. The disease is scattered by air currents and by insects, and if a single spore is put on a peach, cherry or plum, it will develop in twenty-four hours new spores, which will spread rapidly in an orchard, and a whole crop of fruit may be destroyed in a few days by rot. The fungi may attack the leaves and the flowers of the trees. When the flowers are affected they become brownish and rotten, and through the flowers it may enter the twig where it may cause serious damage, especially to the peach. The disease spreads more rapidly in damp weather, and is much more serious. It will cause the bloom or little fruit to drop, or prevent blooms or setting of fruit. Spray.

Preparing Self-Boiled Lime-Sulphur (Summer Strength)

By Prof. W. M. Scott, Pathologist, U. S. Dep't of Agriculture, Washington, D. C.

The mixture used in our experiments during the past season was composed of 8 pounds of fresh stone lime and 8 pounds of sulphur (either flowers or flour may be used) to 50 gallons of water. This appears to be about the correct strength, although in mild cases of scab and brown rot a weaker mixture, containing 6 pounds of each ingredient to 50 gallons of water, may be used with satisfactory results. The mixture can best be prepared in rather large quantities—say enough for 200 gallons at a time, making the formula 32 pounds of lime and 32 pounds of sulphur to be cooked with a small quantity of water (8 or 10 gallons) and then diluted to 200 gallons.

Place the lime in a barrel and pour on enough water to almost cover it. As soon as the lime begins to slake add the sulphur, which should first be run through a sieve to break the lumps. The mixture should be constantly stirred, and more water added as needed to form a thick paste at first and then gradually a thin paste. The lime will supply enough heat to boil the mixture several minutes. As soon as it is well slaked water should be added to cool the mixture and prevent further cooking. It is then ready to be strained into the spray tank, diluted and applied.

The stage at which cold water should be poured on to stop the cooking varies with different limes. Some limes are so sluggish in slaking that it is difficult to obtain enough heat from them to cook the mixture at all, while other limes become intensely hot on slaking, and care must be taken not to allow the boiling to proceed too far. If the mixture is allowed to remain hot fifteen or twenty minutes after the slaking is completed the sulphur gradually goes into solution, combining with the lime to form sulphides which are injurious to peach foliage. It is, therefore, very important, especially with hot lime, to cool the mixture quickly by adding a few

buckets of water as soon as the lumps of lime have slaked down. The intense heat, violent boiling and constant stirring result in a uniform mixture of finely divided sulphur and lime, with only a very small per cent of the sulphur in solution."

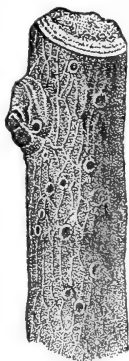


Fig. 26.—Branch of peach, showing perforations of the pin borer, natural size.

APPLYING THE MIXTURE.—The necessity of keeping the mixture thoroughly agitated while spraying cannot be too strongly emphasized. Both self-boiled lime-sulphur and arsenate of lead settle readily, and if the spraying outfit is not equipped with a good agitator the mixture will not be evenly distributed, and some of the trees will be oversprayed while others will receive an insufficient application. In power sprayers the propeller type of agitator is the most satisfactory for this work. The early applications of lime-sulphur may be made rather heavy, but the last spraying should be made with fine nozzles, and the aim should be to give the fruit a uniform coating of a mist-like spray. Heavy drenching of the trees should be avoided.

SPRAY CALENDAR

All authorities now recognize the importance of properly spraying to protect from the ravages of insects fungi diseases. The time to spray is when the application is needed to protect the plant. This will vary, therefore, with every season and with different pests.

The following directions should be followed as closely as possible, as they have been formulated after much experience. Never spray fruits when in bloom.

PLANTS	First Application	Second Application	Third Application	Fourth Application
Apple	When buds begin to swell Lime and Sulphur (winter strength)	Just before blossoms open, Self-Boiled Lime-Sulphur, summer strength, or Bordeaux.	When blossoms have fallen, Lime and Sulphur, summer strength, and arsenites.	10 to 14 days later repeat third application.
Cherry —Rot, aphids, slug.	As buds are breaking, Bordeaux When aphids appears, kerosene emulsion.	When fruit has set, Bordeaux. If slugs appear, Hellebore.	10 to 14 days, if not appears, ammoniacal copper carbonates.	10 to 14 days later, ammoniacal copper carbonates.
Currant —Mildew, worms	At first sign of worms, arsenites or Bordeaux.	10 days later, Hellebore. If leaves mildew, Bordeaux.	If worms persist, Hellebore.	After fruit is harvested, apply Bordeaux freely.
Gooseberry —Mildew, worms.	When leaves expand, Bordeaux; and for worms, as above.	10 to 14 days later, Bordeaux. For worms, as above.	10 to 14 days later, ammoniacal copper carbonate. For worms, as above.	10 to 14 days later, repeat third.
Grape —Fungus diseases and flea beetle.	In spring when buds swell, copper sulphate solution. Paris Green for flea beetle.	When leaves are 1 to 1½ inches in diameter, Bordeaux. Paris Green for larvae of flea beetle.	When blossoms have fallen, Bordeaux, Paris Green, as before.	10 to 14 days later, Bordeaux.
Peach, Nectarine, Apricot.	Before buds swell, Lime and Sulphur, winter strength.	Just before bloom opens, Self-Boiled Lime and Sulphur, summer strength, with arsenites or Bordeaux Mixture with arsenites.	When fruit has set, repeat second.	10 to 14 days later repeat second.
Pear —Leaf blight, scab, codling moth, psylla.	As buds are swelling, copper sulphate solution or Bordeaux.	Just before blossoms open, Bordeaux. For psylla, kerosene emulsion when the leaves open.	After blossoms have fallen, Bordeaux and arsenites; kerosene emulsion if necessary.	8 to 12 days later, repeat third.
Plum —Fungus diseases, curculio.	During first warm days of early spring, Bordeaux for black knot; when the leaves are off in the fall, kerosene emulsion for plum scale.	When the buds are swelling, Bordeaux for black knot and other fungus diseases. During midwinter, kerosene emulsion for plum scale.	When blossoms have fallen, Bordeaux. Begin to jar the trees for curculio before buds start in spring. Kerosene emulsion for plum scale.	10 to 14 days later, Bordeaux. Jar the trees for curculio every two to four days.
Quince —Leaf and fruit spot.	When blossom buds appear, Bordeaux.	When fruit has set, Bordeaux and arsenites.	10 to 20 days later, Bordeaux.	10 to 20 days later, Bordeaux
Raspberry, Blackberry, Dewberry —Anthracnose rust.	Before buds break, copper sulphate solution, Bordeaux. Cut out badly diseased canes.	During summer, if rust appears on the leaves, Bordeaux.	Repeat second if necessary.	Orange or red rust is treated best by destroying entirely the affected plants.
Rose —Mildew, black spot, red spider, aphids.	For mildew, thoroughly stir soil and encourage growth, is the best thing that can be done.	For black spot, spray plants once a week with ammoniacal copper carbonate, using fine spray.	For red spider, spray plants twice a week with kerosene emulsion; apply to underside of foliage.	For aphids, spray the affected parts with kerosene emulsion when necessary.

For all summer spraying self-boiled lime-sulphur, 8-8-50, may be used instead of Bordeaux. (See "Preparation of Self-Boiled Lime-Sulphur," page 27, this book.

Self-Boiled Lime and Sulphur With Arsenate of Lead, Summer Strength

To Make.—After you have made the Summer Strength of Lime and Sulphur it will only be necessary to stir into the above mixture of fifty gallons two pounds of Arsenate of Lead. Use a sprayer with an agitator for any kind of a mixture so as to keep the mixture well stirred while you are spraying.

To Make the Winter Solution of Lime and Sulphur

Formula of Mr. G. M. Bentley, State Entomologist, Knoxville, Tenn.

Quicklime	21 pounds
Sulphur (flowers or flour)	18 pounds
Water	50 gallons

Slake lime in about 5 gallons of hot water; add the sulphur that has been made into a thick paste with water; boil, stirring frequently, for 40 minutes to 1 hour; dilute all to make 50 gallons. While boiling add water from time to time to keep the solution thin enough to boil readily. Stir frequently while wash is boiling.

The above wash may be boiled by fire or steam, according to the amount to be made. An average orchardist will find that very satisfactory boiling may be done by using iron kettles, holding from 25 to 50 gallons. There should be two of those, one for boiling the wash, the other for heating water. The kettles may be set in brick or stone base, with space sufficient beneath for placing wood or coal.

The large orchardist will find it economical to practice the boiling of the wash on a larger scale, using steam and boiling from 2 to 6 barrels at a time.

The above mixture can be purchased in concentrated form from most any wholesale or retail hardware concern ready made, except the addition of water.

Cherry and Plums

The brown rot or fruit mold is the only disease of serious consequence that affects the cherry, and this disease may be controlled by spraying.

The Black Knot of Cherries and Plums

(Extract From Virginia State Crop Pest Commission, Circular No. 35)

The black knot of the plum and cherry is caused by a well known fungus, the botanical name of which is *plowrightia morbosa*. Its occurrence is now, unfortunately, so common that extended description is unnecessary. This trouble is confined to sour cherries and the plums of the garden and orchard, occurring also freely upon native wild cherries and plums.

The disease is disseminated by spores which escape from mature knots. While there are two kinds of spores, one of which is disseminated in late winter or early spring, and the other late during the season, their action upon the host plant is the same and does not complicate the remedial measures.

The infection takes place through the germination of spores which have been scattered by natural agencies and found lodgment in the crevices of the bark. These spots germinate and penetrate along several inches of the stem attacked. This fungus growth irritates the tissues and causes the swelling, which splits the bark by means of a delicate thread-like growth into the cambium layers of the tissue where an abundant growth occurs, extending often longitudinally and exposing the inner layers of the bark. This abnormal growth is first olive green in color. It increases rapidly in size, involving the entire stem, and later becomes a sooty black color.

This disease is one of the easiest to control of any now attracting attention, and yet it is absolutely ruining some of our sour cherry orchards and many plum and damson trees.

Remedy.—The knots can be most readily seen when the plants are dormant, and should be cut out with great care early in winter before the resting spore is dispersed. Another examination should be made late in May or June to discover and remove new knots. If this work is done regularly from the time the trees are first set it requires but little time to go over several hundred trees. If a few knots are neglected for a year or two the whole orchard becomes a mass of knots and the task of eradication difficult. The knots should always be carried from the orchard and burned at once. Trees covered with knots should be cut down and burned.

Plum.—Like the cherry, this fruit is subject to brown rot, and while the disease varies greatly in severity from year to year, the gathering and burning of the mummified fruit should not be neglected. It should be sprayed in the same way and with the same material as the cherry. The plum and cherry are both affected by another serious disease known as the black knot, which is due to the attack of fungus, causing the young and tender branches to assume a peculiar shape. This disease resides in the tissues of the wood, and for that reason cannot be reached by spraying. If taken in time it can be held in check; if not, it will destroy the tree. If badly affected, cut the tree down and burn it. For plum curculio, use same treatment as for apple.

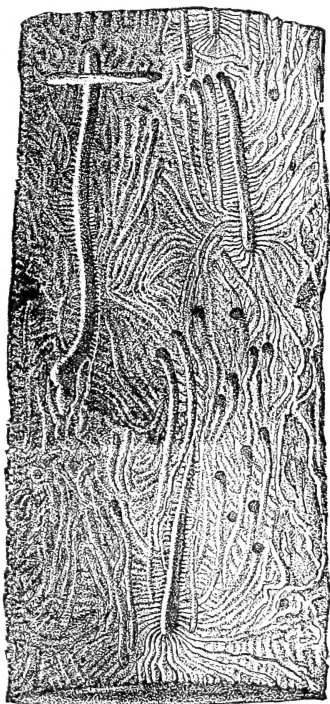
Grape.—The principal diseases affecting the grape are the black rot, downy mildew and anthracnose. The diseases are so well known to farmers throughout the country that it is not necessary to go into a detailed account of them.

Remedy.—Clean the vineyard thoroughly in the spring, burning all the trimmings, rotten berries, dead leaves, and spray.

Pear.—The pear blight is the only disease that does much damage or is worth consideration. The blight is caused by bacteria, the same general class which produce in the human body such diseases as scarlet fever, tuberculosis, etc. The chief method of scattering the disease is through insects which visit the flower. The germs are unable to penetrate the rough part of the tree, hence it is that they attack the tender branches and make their way back into the very trunk, finally destroying the whole tree.

Remedy.—The only reliable means we have for treating this disease is to cut out carefully and promptly all affected parts and burn them.

Pear scab, leaf blight and cracking do some injury, but these diseases may be successfully combated by spraying.



Current—Worms and Mildew.—As soon as the worms are seen spray.

Gooseberry—Mildew and Worms.—As the leaves open spray.

Raspberry and Blackberry—Anthracnose Rust.—Cut out badly diseased canes, spray.

Strawberry—Rust.—Just before the blossoms open spray with Formula No. 3.

In this little book we have tried to cover everything that is necessary to be known in order to grow fruit. But if the farmer should run across anything he does not understand, if he will write to the Agricultural Department or Experiment Station, and send a sample of the disease, they will write him what to do.

Respectfully,

THE GLOBE NURSERIES

FORMULAS AND HOW TO MAKE THEM

Formula No. 1, or the Kerosene Emulsion

Kerosene	2 gallons
Whale-oil soap (or 1 qt. common lye soap) ..	$\frac{1}{2}$ pound
Water	1 gallon

DIRECTIONS—Dissolve the soap in boiling water, and, while hot, add the kerosene, taking care to keep away from the fire. Stir the whole mixture violently for four or five minutes. One quart common lye soap may be used instead of one-half-pound whale-oil soap. Add 15 to 20 gallons of water.

Formula No. 3, or Bordeaux Mixture

Water	50 gallons
Copper Sulphate or Blue Stone	4 pounds
Unslacked Lime	6 pounds

DIRECTIONS—In a barrel or other suitable vessel, place 25 gallons of water, then put the blue stone in a piece of coarse gunny sack or other coarse cloth, tie it up and suspend it in a barrel just beneath the surface of the water. You can tie a bag to a stick, lay it across the barrel and no further attention will be required. In another vessel slack the 4 pounds of lime, using care in order to obtain a smooth paste, free from grit and small lumps. To accomplish this it is better to place the lime in an ordinary water pail and add only a small quantity of water at first, say a quart to a quart and a half, and when the lime begins to crack and crumble and the water to disappear, add another quart or more, exercising care that the lime at no time gets too dry. Toward the last considerable water will be required, but if added carefully and slowly a perfectly smooth paste will be obtained, if the lime is of good quality. Then add water to the lime already slacked to make twenty-five gallons. When the blue stone is entirely dissolved, and the lime is cool, pour the two together very slowly in a barrel holding 50 gallons. The lime should be thoroughly stirred before pouring. It is now necessary to determine whether the mixture is perfect, that is, if it will be safe to apply to the

tender foliage. To accomplish this a simple test may be used. Insert the blade of a pen knife in the mixture and allow it to remain there for one minute. If metallic copper forms on the blade, or, in other words, if the polished surface of the steel assumes the color of copper plate, the mixture is unsafe and more lime must be added. If, on the other hand, the blade of the knife remains unchanged, it is safe to conclude that the mixture is safe and as perfect as can be made. For peaches use only 2 pounds copper sulphate.

Formula No. 5, or the Paris Green Mixture

Paris Green.....	1 pound
Lime	1 pound
Water	150 gallons

DIRECTIONS—Make a fine paste of Paris Green, with a small quantity of water, and then add to the lime, which has been slacked in a bucket. Pour the mixture through a strainer into a barrel and then add the water.

N. B.—Where large amounts of the above formulas are not wanted any amount can be made by using the proportions given in the formulas. If you want your trees to live and bear fruit, do your duty and follow the instructions given in this book, set them out right, prune correctly, cultivate or mulch well, and spray for diseases, and you will get results, otherwise you will not.

DISTANCE TO SET TREES—Many orchardists differ as to the proper distance trees should be set apart, but we have adopted the following rule: Apple trees, 30 feet apart each way; Peach trees, 15 feet; Pears and Cherries, 18 feet; Plums, 16 feet; Grapes, 7 to 9 feet; Currants and Gooseberries, 3 to 4 feet; Raspberries and Blackberries, 3 to 4 feet, and Strawberries, 3 feet by 1½ feet.

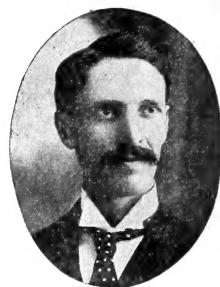
The Gentlemen Who Own the Globe Nurseries



G. E. NICKELS



J. L. WOOD



W. M. WOOD

Sprays and Spraying Apparatus

Below we give the names of manufacturers and agents, any of whom we believe to be reliable. If you are in need of a Spray write to them for a Catalogue and Price List:

W. E. Tribbett, Staunton, Va.

Field Force Pump Company, Elmira, N. Y.

Goulds Manufacturing Company, Seneca Falls, N. Y.

Morrill & Morley, Benton Harbor, Mich.

Deming Pump Company, Salem, Ohio.

Spray Motor Company, Buffalo, N. Y.

Wm. Stahl, Quincy, Ill.

F. E. Myers Pump Company, Ashland, Ohio.

American Horticultural Distributing Company,
Martinsburg, W. Va.